

REMARKS / ARGUMENTS

This application is believed to be in condition for allowance because the claims, as amended, are believed to be in compliance with the requirements of 35 USC §112, second paragraph. The following paragraphs provide the justification for this belief. In view of the following reasoning for allowance, the Applicant hereby respectfully requests further examination and reconsideration of the subject patent application.

1.0 Rejections under 35 USC §101:

The Office Action rejected claims 1-11 under 35 USC §101 as being directed to non-statutory subject matter. In particular, the Office Action objected to the claims as potentially being embodied in a non-statutory carrier wave embodiment in view of the specification.

In response, Applicant has amended independent claim 1 to limit the claimed invention to a "physical computer-readable medium..." It is believed that by limiting the claimed invention to computer executable instructions **stored** on a **physical** computer-readable medium that the claim can no longer be interpreted as being embodied in a carrier wave. As such, Applicant believes that the present amendment overcomes the rejection under 35 USC §101. Therefore, Applicant respectfully requests withdrawal of the rejection of claims 1-11 under 35 USC §101 in view of the amendments to claim 1.

2.0 Rejections under 35 USC §112, Second Paragraph:

The Office Action rejected claim 9 under 35 USC §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention.

In particular, the Office Action correctly identified a typographical error in the dependency of claim 9. As noted by the Office Action, claim 9 should depend from claim 7

rather than claim 8. Applicants have amended claim 9 to correct this dependency. In view of the amendment to claim 9, Applicant respectfully requests withdrawal of the rejection of claim 9 under 35 USC §112, second paragraph.

3.0 Rejections under 35 USC §102(e):

In the Office Action of December 13, 2006, claims 12, 14 and 15 were rejected under 35 USC §102(e), as being anticipated by U.S. Patent Application Publication No. 20020181762 to Silber (hereinafter "**Silber**").

A rejection under 35 USC §102(e) requires that the Applicant's invention was described in patent granted on an application for patent by another filed in the United States before the invention thereof by the Applicant. To establish that a patent describes the Applicant's invention, all of the claimed elements of an Applicant's invention must be considered, especially where they are missing from the prior art. If a claimed element is not taught in the referenced patent, then a rejection under 35 USC §102(e) is not proper, as the Applicant's invention can be shown to be patentably distinct from the cited reference.

In view of the following discussion, the Applicants will show that one or more elements of the Applicants claimed invention are missing from the cited art, that the cited art requires one or more elements that are not used by the Applicants claimed invention, and that the Applicants invention is therefore patentable over that cited art.

3.1 Rejection of Independent Claim 12:

In general, the Office Action rejected independent claim 12 under 35 USC §102(e) based on the rationale that the **Silber** reference teaches the Applicants' claimed computer-readable medium..." for removing occlusions from a composite image. However, in view of the following discussion, Applicant will show that the **Silber** reference does not teach

the Applicants claimed invention, and that the claimed invention is therefore patentable over the cited art.

In particular, with respect to the issue of occlusions, the Office Action suggests that the *Silber* reference discloses "identifying areas of potential occlusions in each of the aligned images..." However, Applicant believes that the Office Action has misinterpreted the capabilities and features of the *Silber* reference with respect to these alleged occlusion identification capabilities. Further, Applicant would like to point out that neither the term "occlusion," nor any analogous term, is mentioned in the *Silber* reference. In addition, as is well known to those skilled in the art, an occlusion in an image occurs when an object in one image frame of a particular scene covers or occludes all or part of another object in another image frame of that particular scene. As discussed in further detail below, *Silber* is incapable of making such determinations.

Further, it should be clear that as described by *Silber* in the Abstract, in independent claims 1, 20, 21 and 22, and throughout the specification with respect to Figures 1-13, *Silber* is directed towards compositing images of single objects or "workpieces" in the case where each of the multiple images of the single objects is captured at a ***different depth of focus***. In fact, *Silber* makes use of different depths of focus, ***in every disclosed and claimed embodiment***, in order to capture 3D details of the single workpiece such that each feature of the single workpiece is captured at various levels of focus. The edges of each image are then examined to select those edges that are in best focus, with the best focused edges then being used to construct a composite image of the single workpiece.

The Office Action attempts to partially address this issue by suggesting that in fig. 5, step 730, and in paragraph [0089], *Silber* teaches "determining whether each area of potential occlusion in the seed image is an actual area of occlusion by examining each area of potential occlusion in the seed image to determine whether a level of discontinuity along an outer edge of each area of discontinuity exceeds a predetermined threshold." The Office Action states that this feature of the Applicant's claimed invention is taught by

Silber “since the amount of focus of the line, which is equivalent to discontinuous because it is not a solid, clear line, is compared to a threshold...”

Clearly, both the Applicant and **Silber** examine detected edges in images. However, where **Silber** examines edges to determine whether a particular edge represents a best level focus for that edge, Applicant describes and claims a technique whereby a determination of an area of occlusion is accomplished by an evaluation of detected edges.

For example, in paragraph [0016], **Silber** specifically summarizes his invention as follows:

“[0016] This invention separately provides systems and methods that ***construct a desirable composite image while suppressing likely artifacts arising from out-of-focus features.***”

Further, in paragraph [0089], as cited by the Office Action with respect to Figure 3, **Silber** teaches the following:

“[0089] In step S730, a *determination is made whether the selected source image analysis result is **indicative of a valid edge***. For example, if the source image analysis result is a **numerical edge-focus indicator** result, this result is **compared to a numerical threshold value**, where only **values exceeding the threshold value are taken to be indicative of a valid and adequately-focused edge for purposes of constructing the composite image**. If the source image analysis result is not indicative of a valid edge, then operation returns to step S715. Otherwise, operation continues to step S735.” (emphasis added)

Clearly, the capability to determine whether an edge is **adequately focused** in view of some **predetermined focus threshold** (e.g., the “numerical threshold value” described

by **Silber**) fails completely to provide a technique for deciding whether a particular edge represents the boundary of an object that is occluding some portion of a scene.

In fact, the invention described by **Silber** is specifically directed towards constructing a composite image from multiple images of a single object or workpiece based solely **on which edges are in best focus**. Consequently, Applicant respectfully suggests that any composite image created by the **Silber** invention from a set of images that include one or more occluding regions or objects would tend to randomly include portions of both occluding objects and non-occluded regions of images as a function of edge focus levels rather than whether or not an area was actually occluded. In fact, Applicant believes that the edges of occluding objects would be **avored** by the **Silber** system since the edges of any occluding object in a particular image frame would clearly be in better focus than those edges would be in a frame in which the occluding object did not exist.

In other words, **Silber** fails completely to provide any technique whatsoever for making a determination as to whether an area of an image is occluded, and then to selectively replace any occluded areas with corresponding non-occluded regions from other images. Further, Applicant believes that the system disclosed by **Silber** would tend to randomly include portions of occluding objects in the final composite image, with edges of composite images being favored as representing a best level of edge focus with respect to any image frames in which the occluding object is present.

Therefore, in view of the preceding discussion, it is clear that the present invention, as claimed by independent claim 12 has elements not disclosed in the **Silber** reference. Consequently, the rejection of claim 12 under 35 USC §102(e) is not proper. Therefore, the Applicants respectfully traverse the rejection of claim 12, and thus of dependent claims 14 and 15, and respectfully request reconsideration of the rejection of these claims under 35 USC §102(e) in view of the language of claim 12. In particular, claim 12 recites the following novel language:

"A system for removing occlusions from a composite image formed from a set of images of a scene, comprising:

acquiring at least two images of a scene from approximately the same viewpoint;

aligning each of the images to a base image selected from the set of images;

identifying areas of potential occlusion in each of the aligned images;

selecting a seed image from the set of images;

determining whether each area of potential occlusion in the seed image is an actual area of occlusion by examining each area of potential occlusion in the seed image to determine whether a level of discontinuity along an outer edge of each area of discontinuity exceeds a predetermined threshold;

replacing areas of actual occlusion in the seed image with corresponding non-occluded areas from one of the other images in the set to form a composite image from the seed image." (emphasis added)

4.0 Rejections under 35 USC §103:

The Office Action rejected claims 1-3, 7-9, 11, 17-19 and 21 under 35 USC §103(a) as being unpatentable over ***Silber***, in view of U.S. Patent No. 6,366,316 to Parulski, et al. (hereinafter "***Parulski***").

In order to deem the Applicant's claimed invention unpatentable under 35 USC §103(a), a prima facie showing of obviousness must be made. However, as fully explained by the M.P.E.P. Section 706.02(j), to establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, ***the prior art***

reference (or references when combined) must teach or suggest all the claim limitations.

Further, in order to make a prima facie showing of obviousness under 35 USC 103(a), all of the claimed elements of an Applicant's invention must be considered, especially when they are missing from the prior art. If a claimed element is not taught in the prior art and has advantages not appreciated by the prior art, then no prima facie case of obviousness exists. The Federal Circuit court has stated that it was error not to distinguish claims over a combination of prior art references where a material limitation in the claimed system and its purpose was not taught therein (*In Re Fine*, 837 F.2d 107, 5 USPQ2d 1596 (Fed. Cir. 1988)).

4.1 Rejection of Claims 1-3, 7-9 and 11:

In general, the Office Action rejected independent claim 1 under 35 USC §103(a) based on the rationale that the ***Silber*** reference discloses the claimed invention with the exception of "comparing the set of images to identify areas of difference between the images for all images, said areas of difference representing regions of potential occlusion in each image." The Office Action then continues by suggesting that this feature lacking in the ***Silber*** reference is disclosed by the ***Parulski*** reference.

First, with respect the ***Parulski*** reference, the Office Action suggests that ***Parulski*** teaches "comparing the set of images to identify areas of difference between the images for all images, said areas of difference representing regions of potential occlusion in each image."

However, in contrast to the position advanced by the Office Action, Applicant respectfully suggests that what ***Parulski*** actually discloses is a technique wherein a first image is ***specifically identified*** as a "subject plus background" and a second image is ***specifically identified*** as "background only" are compared to extract the "subject" from the "background" (see Figure 1 and associated discussion). As such, ***Parulski*** is

inherently limited to processing two images, which are captured from a “camera firmly mounted on a tripod” (see step 10 of Figure 1). Further, the system described by **Parulski** must also be **specifically told** which of the two images includes the “subject.” Otherwise, there is no way to ensure that the “foreground mask image” described with respect to steps 22 and 24 of Figure 1 will actually include the “subject” that is to be transferred to the composite image illustrated by steps 26 and 32 of Figure 1 of the **Parulski** reference.

Consequently, **Parulski** is capable simply of subtracting a second image from a first image, and then pasting the result of that subtraction onto a third image to create a composite image. In addition, **Parulski** suggests the optional use of noise reduction techniques to remove potential artifacts resulting from camera noise or other noise sources along with the use of manual user applied techniques to “clean up” “holes” left in the composite image and techniques to “clean up” edges resulting from the above-described pasting operation.

Next, as discussed above in Section 3.1 with respect to the rejection of claim 12, the **Silber** reference is incapable of determining, for any image, whether regions of potential occlusion represent actual regions of occlusion. In particular, as discussed above, the **Silber** reference operates by identifying edges in a set of images that represent the best levels of focus for particular edges. **Silber** does not have any capability to determine whether one region is occluding another. Note that the discussion provided in Section 3.1 is incorporated by reference for purposes of brevity rather than repeat that entire discussion here.

Consequently, the proposed **Silber-Parulski** combination appears to be substantially more limited than the **Silber** reference alone. Specifically, Applicant believes that the proposed **Silber-Parulski** combination will operate as follows. First, the proposed **Silber-Parulski** combination will receive **two images**, and then the second image will be subtracted from the first image to provide a single image of a “subject.” This first step represents the **Parulski** contribution to the proposed **Silber-Parulski** combination. Next, the proposed **Silber-Parulski** combination will detect the edges in the single image of the

subject, and since there is only one image, it will be forced to accept all edges of the "subject" image as having a valid focus. Since there is only one remainder image following the initial subtraction step, that image, and its supposedly valid edges will comprise the entire "composite image."

In other words, Applicant believes that the proposed **Silber-Parulski** combination will simply output the difference between a first image and a second image without making any determination as to whether any region of one image is occluding any region of any other images.

Therefore, since **Silber** is incapable of identifying occluded regions in a set of images, and since the proposed **Silber-Parulski** combination is incapable of creating a composite image wherein those occluded regions have been removed, it should be clear that the proposed **Silber-Parulski** combination fails to disclose the elements of Applicant's claimed invention. As such, it is clear that the present invention, as claimed by independent claim 1 includes elements not taught in the proposed **Silber-Parulski** combination reference. Consequently, the rejection of independent claim 1, and of dependent claims 2-3, 7-9 and 11, under 35 USC §103(a) is not proper. Therefore, the Applicants respectfully traverse the rejection of claims 1-3, 7-9 and 11, and request reconsideration of the rejection of those claims under 35 USC §103(a) in view of the novel language of claim 1. In particular, claim 1 recites the following novel language:

"A physical computer-readable medium having stored thereon computer executable instructions for automatically constructing an image mosaic from a set of images of a scene, said computer executable instructions comprising:

- inputting a set of images of a scene;
- registering the set of images;
- comparing the set of images to identify areas of difference between the images for all images, **said areas of difference representing regions of potential occlusion in each image;**

determining, for each image, whether regions of potential occlusion in each image represent actual regions of occlusion, or whether the regions of potential occlusion in each image represent regions of non-occlusion, by determining a level of discontinuity along an exterior border of each region of potential occlusion in each image; and
creating a mosaic image by replacing at least one actual region of occlusion in one image from the set of images with corresponding regions of non-occlusion from at least one other image from the set of images of the scene. (emphasis added)

4.2 Rejection of Claims 17-19:

The Office Action rejected claims 17-19 in view of the proposed ***Silber-Parulski*** combination discussed above. However, claims 17-19 are dependent from claim 12, which as discussed above in Section 3.1 is allowable under 35 USC §102(e).

Consequently, since the parent claim (claim 12) of claims 17-19 is allowable, citing additional references in attempt to show equivalence to particular features of dependent claims still fails to address the novelty of the parent claim. As such, since claim 12 is allowable, dependent claims 17-19 are also inherently allowable. Consequently, Applicant respectfully traverses the rejection of claims 17-19 in view of novelty of claim 12, as discussed above.

4.3 Rejection of Claim 21:

In general, the Office Action rejected independent claim 21 under 35 USC §103(a) based on the rationale that the ***Silber*** reference discloses the claimed invention with the exception of “comparing each of the aligned images to identify areas of potential occlusion in each of the aligned images.” The Office Action then continues by suggesting that this feature lacking in the ***Silber*** reference is disclosed by the ***Parulski*** reference.

First, with respect the **Parulski** reference, the Office Action suggests that **Parulski** teaches "comparing each of the aligned images to identify areas of potential occlusion in each of the aligned images."

However, in contrast to the position advanced by the Office Action, Applicant respectfully suggests that what **Parulski** actually discloses is a technique wherein a first image is **specifically identified** as a "subject plus background" and a second image is **specifically identified** as "background only" are compared to extract the "subject" from the "background" (see Figure 1 and associated discussion). As such, **Parulski** is inherently limited to processing two images, which are captured from a "camera firmly mounted on a tripod" (see step 10 of Figure 1). Further, the system described by **Parulski** must also be **specifically told** which of the two images includes the "subject." Otherwise, there is no way to ensure that the "foreground mask image" described with respect to steps 22 and 24 of Figure 1 will actually include the "subject" that is to be transferred to the composite image illustrated by steps 26 and 32 of Figure 1 of the **Parulski** reference.

Consequently, **Parulski** is capable simply of subtracting a second image from a first image, and then pasting the result of that subtraction onto a third image to create a composite image. In addition, **Parulski** suggests the optional use of noise reduction techniques to remove potential artifacts resulting from camera noise or other noise sources along with the use of manual user applied techniques to "clean up" "holes" left in the composite image and techniques to "clean up" edges resulting from the above-described pasting operation.

Next, as discussed above in Section 3.1 with respect to the rejection of claim 12, the **Silber** reference is incapable of determining, for any image, whether regions of potential occlusion represent actual regions of occlusion. In particular, as discussed above, the **Silber** reference operates by identifying edges in a set of images that represent the best levels of focus for particular edges. **Silber** does not have any capability to determine whether one region is occluding another. Note that the discussion provided in

Section 3.1 is incorporated by reference for purposes of brevity rather than repeat that entire discussion here.

Consequently, the proposed **Silber-Parulski** combination appears to be substantially more limited than the **Silber** reference alone. Specifically, Applicant believes that the proposed **Silber-Parulski** combination will operate as follows. First, the proposed **Silber-Parulski** combination will receive **two images**, and then the second image will be subtracted from the first image to provide a single image of a "subject." This first step represents the **Parulski** contribution to the proposed **Silber-Parulski** combination. Next, the proposed **Silber-Parulski** combination will detect the edges in the single image of the subject, and since there is only one image, it will be forced to accept all edges of the "subject" image as having a valid focus. Since there is only one remainder image following the initial subtraction step, that image, and its supposedly valid edges will comprise the entire "composite image."

In other words, Applicant believes that the proposed **Silber-Parulski** combination will simply output the difference between a first image and a second image without making any determination as to whether any region of one image is occluding any region of any other images.

Therefore, since **Silber** is incapable of identifying occluded regions in a set of images, and since the proposed **Silber-Parulski** combination is incapable of creating a composite image wherein those occluded regions have been removed, it should be clear that the proposed **Silber-Parulski** combination fails to disclose the elements of Applicant's claimed invention. As such, it is clear that the present invention, as claimed by independent claim 21 includes elements not taught in the proposed **Silber-Parulski** combination reference. Consequently, the rejection of independent claim 21 under 35 USC §103(a) is not proper. Therefore, the Applicant respectfully traverses the rejection of claim 21 and requests reconsideration of the rejection of claim 21 under 35 USC §103(a) in view of the novel language of claim 21. In particular, claim 21 recites the following novel language:

"A computer-implemented process for removing occlusions from a mosaic image created from a set of images of a scene, comprising:

- inputting a set of two or more images of a scene;
- aligning each of the images to a base image selected from the set of images;
- comparing each of the aligned images to ***identify areas of potential occlusion*** in each of the aligned images;
- determining a level of discontinuity along an outer edge of each area of potential occlusion for each image***, said level of discontinuity indicating an area of actual occlusion where the level of discontinuity exceeds a predetermined discontinuity threshold, and ***said level of discontinuity indicating an area of non-occlusion where the level of discontinuity is less than the predetermined discontinuity threshold***;
- creating an image mask for each image, said ***image masks indicating areas of occlusion and areas of non-occlusion for each image***; and
- using the image mask for each image for creating a mosaic image by ***replacing areas of actual occlusion in one of the images with corresponding areas of non-occlusion from one of the other images***."

(emphasis added)

5.0 Rejection of Claims 4-5, 10, 13, 16, 20, and 22-28, under 35 USC §103(a):

The Office Action rejected dependent claims 4-5, 10, 13, 16, 20, and 22-28 in view of the proposed ***Silber*** reference in combination with various other references. However, claims 4-5, 10 are dependent from claim 1, which as discussed above in Section 4.1 is allowable under 35 USC §103(a). Similarly, claims 13, 16, and 20 are dependent from claim 12, which as discussed above in Section 3.1 is allowable under 35 USC §102(e). Finally, claims 22-28 are dependent from claim 21, which as discussed above in Section 4.3 is allowable under 35 USC §103(a).

Consequently, since each of the parent claims of dependent claims 4-5, 10, 13, 16, 20, and 22-28 (e.g., claims 1, 12 and 21) are allowable, citing additional references in attempt to show equivalence to particular features of dependent claims still fails to address the novelty of the parent claims. As such, since claims 1, 12 and 21 are allowable, dependent claims 4-5, 10, 13, 16, 20, and 22-28 are also inherently allowable. Consequently, Applicant respectfully traverses the rejection of claims 4-5, 10, 13, 16, 20, and 22-28 in view of novelty of their respective parent claims, as discussed above.

CONCLUSION

In view of the above discussion, it is respectfully submitted that claims 1-20 are in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of claims 1-20 and to pass this application to issue at the earliest opportunity. Additionally, in an effort to further the prosecution of the subject application, the Applicant kindly invites the Examiner to telephone the Applicant's attorney at (805) 278-8855 if the Examiner has any additional questions or concerns.

Respectfully submitted,



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